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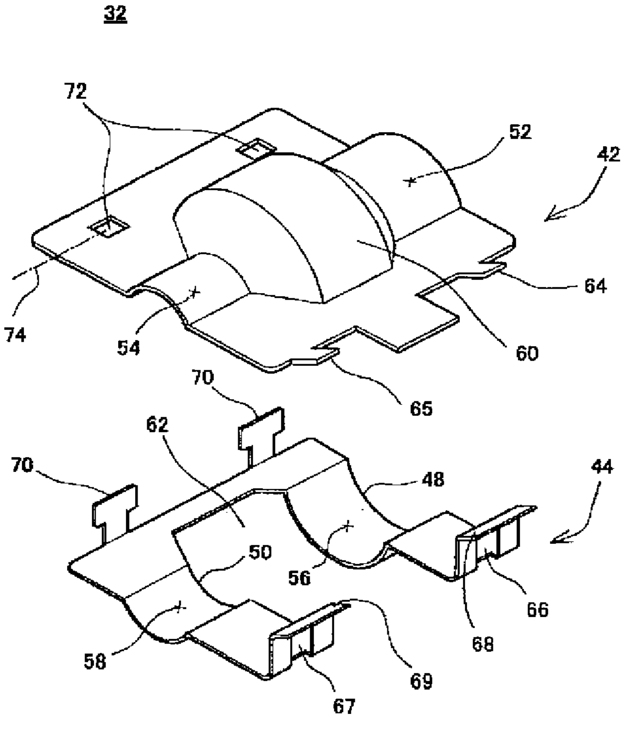
(54)【発明の名称】　回転規制クランプとそれを利用した燃料配管

(57)【要約】
【課題】　両管がストレートに伸びる場合にも、また、ジョイントないし管の外周に平行な二面幅が確保されていない場合にも、エンジンルーム内で生じる振動により起こりえる２つの管の相対回転を規制する。
【解決手段】　回転規制クランプ３２は、ほぼ長方形の上板４２と、凹形状の下板４４からなる。上板４２は、ジョイントの小径部の外周に接する第1押圧面５２、ジョイントの大径部を収容する膨らみ６０、第２管の外周に接する第２押圧面５４を備えた第１板バネである。下板４４は、上板４２に開閉自在に組み付けられ、第1押圧面５２が接する外周の半径方向反対側からその外周に接する第３押圧面５６と、上板４２との間で閉じられた状態を保持する保持手段６６を備えた第２板バネ４８および、第２押圧面５４が接する外周の半径方向反対側からその外周に接する第４押圧面５８と、上板４２との間で閉じられた状態を保持する保持手段６７を備えた第３板バネ５０からなる。



【特許請求の範囲】

【請求項１】　一端側が小径で他端側が大径の管状ジョイントの小径側に相対回転を規制された状態で接続された第１管またはその管状のジョイントと、その管状ジョイントの大径側に挿入された第２管との相対回転を規制するために用いられるクランプであって、

ジョイントの小径部または第１管の外周に半周以下の範囲で接する第１押圧面と、ジョイントの大径部を収容する膨らみと、第２管の外周に半周以下の範囲で接する第２押圧面を備えた第１板バネと、

第１板バネに開閉自在に組み付けられ、閉じられたときに前記第１押圧面が接する外周の半径方向反対側からその外周に接する第３押圧面と、前記第１板バネとの間で閉じられた状態を保持する保持手段を備えた第２板バネと、

第１板バネに開閉自在に組み付けられ、閉じられたときに前記第２押圧面が接する外周の半径方向反対側からその外周に接する第４押圧面と、前記第１板バネとの間で閉じられた状態を保持する保持手段を備えた第３板バネとを有する回転規制クランプ。

【請求項２】　自動車のエンジンルーム内に位置し、基部が車体側に取付けられた燃料配管とエンジン側に取付けられた燃料配管の先端同士を、一端側が小径で他端側が大径の管状ジョイントで接続し、且つジョイントの小径部またはその小径部に接続された燃料配管から他方の燃料配管まで亘って伸びるとともにジョイントの小径部またはその小径部に接続された燃料配管の外周を押圧する一対のバネ片と他方の燃料配管の外周を押圧する一対のバネ片とを有する板バネ製の回転規制クランプによって車体側燃料配管とエンジン側燃料配管の相対回転が規制された燃料配管。

【請求項３】　自動車のエンジンルーム内に位置して基部が車体側に固定された燃料配管と、自動車のエンジンルーム内に位置して基部がエンジン側に固定された燃料配管の先端同士を相対回転を規制した状態で接続する方法であって、

管状のジョイントに前記先端同士を反対方向から接続して両配管を接続し、

ついで、相対回転を規制する管と管にまたがって伸びる回転規制クランプによって相対回転を規制する管と管のそれぞれの外周を押圧することで両配管の相対回転を規制する燃料配管の接続方法。

【発明の詳細な説明】

【０００１】

【発明の属する技術分野】本発明は、ジョイントで接続された２つの管の相対回転を規制する技術に関する。特に、自動車のエンジンルーム内で車体側から伸びる燃料配管とエンジン側から伸びる燃料配管の相対回転を規制しながら接続するために好適な技術に関する。

【０００２】

【従来の技術】２つの管を接続する際に、両管を抜け止めした状態で液密に接続するために、ジョイントを用いる技術が知られている。そのジョイントの一例が、特開平７－３１７９８２号公報に開示されている。通常、一方の管はジョイントの一端側に圧入やかしめ等の手法によって接続されており、その状態のジョイントの他端側に他方の管が挿入されて両管が接続される。そのジョイントには挿入された他方の管が抜けないようにする構造が用意されており、そのために、挿入側が大径となっている。通常、挿入された管の外周とそれを受け入れるジョイントの内周の間にＯリング等のシール部材が施されており、それによって両管は液密に接続される。この接続技術は信頼性が高く、現在多用されている。

【０００３】しかし、例えば自動車の配管など、振動や高熱が加わる環境下で長期間に亘って液密を維持するためには、ジョイントによる接続のみでは足りず、さらに回転禁止クランプを用いることによって、両管の相対回転を禁止する必要がある。両管が相対回転すると、Ｏリング等のシール部材が損傷しやすく、液密状態を維持できる期間が短縮化される恐れがあるからである。

【０００４】そこで、両管の相対回転を禁止するために、回転禁止クランプを用いる技術が種々開発されている。その一例が、特開平９－２６９０８８号公報に開示されている。この技術を図１を用いて説明する。この技術では、一方の管８の先端がジョイント２の小径部６に圧入されて相対回転しないように接続されている。このジョイント２の他端側に他方の管１０が挿入される。管１０の外周とジョイント２の内周の間にＯリングが挿入され、管８と管１０が液密に接続される。ジョイント２の管１０の挿入側は大径となっており、その内部に管１０の抜け止め構造が収容されている。ジョイント１０の外周の一部を切欠いて平行に伸びる二面幅４が形成されている。この二面幅４と一対の側壁１６を利用して回転禁止クランプ１２をジョイント２に回り止めする。管１０はその先端部において曲げられている。回転禁止クランプ１２の先端には曲げられた管１０が通過するスリット２０が設けられている。このスリット２０によって管１０はジョイント２に対して相対回転することが禁止される。

【０００５】

【発明が解決しようとする課題】この技術は管１０が曲がっている場合には有効であるが、管１０がストレートに伸びている場合には有効でない。管１０がストレートに伸びている場合には、ジョイント２に設けたのと同様の平行な二面幅を管１０の外周に設ける必要がある。しかし、管１０の外周に平行な二面幅を形成することは不可能ではないまでも面倒であり、製作コストを増大させる。また、現在多用されている多くのジョイント２が平行な二面幅を持っておらず、多くのジョイントに対してこの技術は使えない。

【０００６】外周の断面が円形のジョイントないしは管に対して外側から回り止め部材を取付けることで回り止めする技術は、現在のところ、少なくともエンジンルーム内の燃料配管に関する限り実用化されていない。その理由は、高温にさらされるエンジンルーム内で使用するために、ジョイントも回り止め部材も樹脂等で形成されることは好ましくなく、金属で形成する必要があり、断面円形の金属製の管の回りに金属製の回り止め部材を取付けて回り止めする構造による場合、金属同士の摩擦係数が低いことから、有効に回り止めするためには、強大な押付け荷重が必要とされ、場合によっては管が破壊され、あるいは、その押圧荷重を得るために特殊な動力工具が必要とされるほどの押圧荷重が必要とされると考えられていたからである。

【０００７】しかし、本発明者らは、回り止めする必要性を根本からみなおした結果、従来の考えが正当でないことを認識することができた。従来の考えが正当でないと認識する理由は、以下のとおりである。

【０００８】エンジンルーム内の燃料配管は、車体側から伸びる燃料配管とエンジン側から伸びる燃料配管をジョイントで接続させることで構成されている。エンジンは車体に対してエンジンマウントを介して接続されており、そのエンジンマウントは弾性を有することから、エンジンと車体とは相対的に変位する。この変位が通常は振動となって現れる。ジョイントにおいて２つの燃料配管を回り止めするというのも、上記の振動に抗して回り止めできれば良く、回転規制クランプによって相対回転を規制することができるトルクに上限があっても、燃料配管についてみれば十分に回り止めしているということができる。その範囲内で相対回転が規制できれば良いことに着目すれば、金属製の管の外周に金属製の部材を押圧する方式によって、管を押しつぶすほどの押圧力を要しないで、エンジンルーム内の燃料配管に必要とされる限度においては回り止めする事が可能であることを認識したからである。

【０００９】本発明は、以上の認識に基づいて、両管がストレートに伸びる場合にも、また、ジョイントないし管の外周に平行な二面幅が確保されていない場合にも、エンジンルーム内で生じる振動により起こる２つの管の相対回転を規制する事を課題とする。

【００１０】

【課題を解決するための手段および作用と効果】本発明の燃料配管は、自動車のエンジンルーム内に位置している燃料配管であり、基部が車体側に取付けられた燃料配管と基部がエンジン側に取付けられた燃料配管の先端同士を管状ジョイントで接続したものである。前記のジョイントは一端側が小径で他端側が大径の管状であり、その一端側に一方の燃料配管が接続され、他端側に他方の燃料配管が接続される。この接続構造に対し、本発明の燃料配管では、ジョイントの小径部またはその小径部に接続された燃料配管から他方の燃料配管まで亘って伸びる長さを有する回転規制クランプによって相対回転を規制している。この回転規制クランプは、ジョイントの小径部またはその小径部に接続された燃料配管の外周を押圧する一対のバネ片と他方の燃料配管の外周を挟持する一対のバネ片とを有し、板バネ製である。この燃料配管は、管の外周を板バネで押圧する単純な構造で回り止めされているにすぎないにもかかわらず、必要な限度において長期間に亘って回り止めでき、燃料配管に高い信頼性を実現する。よって、燃料配管がストレートに伸びていても、あるいは、燃料配管に二面幅が確保されていなくとも、回り止めする事ができ、相対回転を規制することができる。Ｏリング等のシール部材が燃料配管間に装着される場合、回転規制クランプによって両管の相対回転を直接的に規制しても良いし、あるいは一方の燃料配管がジョイントに相対回転できない場合には他方の燃料配管とジョイントの相対回転を禁止して間接的に燃料配管同士の相対回転を規制しても良い。シール部材がジョイントと一方の燃料配管間に装着される場合、他方の燃料配管はジョイントに相対回転不能で液密に接続されている。この場合、一方の燃料配管に対して、ジョイントと他方の燃料配管のいずれを回り止めしても良い。

【００１１】また、この発明の燃料配管の接続方法は、自動車のエンジンルーム内に位置して基部が車体側に固定された燃料配管と、自動車のエンジンルーム内に位置して基部がエンジン側に固定された燃料配管の先端同士を相対回転を規制した状態で接続する方法に関するものであり、管状のジョイントに前記先端同士を反対方向から接続して両配管を接続し、ついで、相対回転を規制する管と管にまたがって伸びる回転規制クランプによって相対回転を規制する管と管のそれぞれの外周を押圧することで両配管の相対回転を規制することを特徴とする。この接続方法によると、きわめて簡単な操作で、信頼性の高い燃料配管を組み付けることができる。相対回転を規制する管と管とは、管状のジョイントと一方の燃料配管の場合もあれば、２つの燃料配管であることもある。

【００１２】この発明は、また、回転規制クランプ自体に具現化される。この回転規制クランプは、一端側が小径で他端側が大径の管状ジョイントの小径側に相対回転を規制された状態で接続された第１管またはその管状のジョイントと、その管状ジョイントの大径側に挿入された第２管との相対回転を規制するために用いられるものであって、第１板バネと第２板バネと第３板バネとを備えている。第１板バネは、第１管の外周に半周以下の範囲で接する第１押圧面と、ジョイントの大径部を収容する膨らみと、第２管の外周に半周以下の範囲で接する第２押圧面を備えている。第２板バネは第１板バネに開閉自在に組み付けられ、閉じられたときに前記第１押圧面が接する外周の半径方向反対側からその外周に接する第３押圧面と、前記第１板バネとの間で閉じられた状態を

保持する保持手段を備えている。第３板バネは第１板バネに開閉自在に組み付けられ、閉じられたときに前記第２押圧面が接する外周の半径方向反対側からその外周に接する第４押圧面と、前記第１板バネとの間で閉じられた状態を保持する保持手段を備えている。このクランプによると、第１板バネで２つの管が同軸に位置決めされ、その状態で、第１板バネと第２板バネの間で一方の管が回り止めされ、第１板バネと第３板バネの間で他方の管が回り止めされ、結局２管が回り止めされる。

【００１３】

【発明の実施の形態】次に、本発明に係る回転規制クランプとそれを利用した燃料配管の実施の形態を実施例に基づき説明する。図２は、燃料配管の接続部分の断面図である。

【００１４】図２に示すように、この接続部分では、第１管２２と第２管２４がジョイント２６によって接続されている。そして、この第１管２２と第２管２４がジョイント２６で接続された後に、相対回転を規制するクランプ３２が外側から取付けられている。ジョイント２６に挿入される前の第２管２４は断面で示され、挿入された後の第２管は外形線で示されている。

【００１５】第１管２２は耐熱性樹脂で成形された燃料配管であり、図示されない基部が車体側に固定されている。この第1管２２の先端は金属製のジョイント２６の小径部２８から挿入され、その状態でジョイント２６の小径部２８が外側からかしめられ、第１管２２はジョイント２６の小径部２８に液密かつ相対回転不能に接続されている。ジョイント２６の大径部３０の内側には、抜け止めバネ３６が挿入されている。この抜け止めバネ３６の自由端３６ａ側は円周方向に分割されており、自由端３６ａ同士の中心に開口を持つ。第２管２４は金属製の燃料配管であり、図示されない基部がエンジンに固定されている。第２管２４の先端近傍に、第1のリング状の膨出部３８、第２のリング状の膨出部４０が形成されている。

【００１６】第２管２４をジョイント２６の大径部３０に挿入すると、第1のリング状の膨出部３８が抜け止めバネ３６の中心開口を押し広げて通過し、通過すると、抜け止めバネ３６の自由端３６ａが第1のリング状の膨出部３８に図示右側から当接して第２管２４がジョイント２６から抜けないようにする。第１管２２の内側には２本のOリング３４がセットされており、第２管２４が抜け止めバネ３６で抜き止めされるまで挿入されると、そのOリング３４が第２管２４の外周に密着して第１管２２と第２管２４を液密に接続する。第１管２２と第２管２４が相対回転を続けると、Ｏリング３４が損傷し、液密が短時間で破られる可能性がある。あるいは、第１管２２と第２管２４の同軸度が失われると、Ｏリング３４が不均一に変形し、これも液密が破られる要因となりえる。上記した様に、第１管２２はジョイント２６に回り止めされているので、ジョイント２６に対して第２管２４が回り止めされれば、結局第１管２２と第２管２４が回り止めされる。また、ジョイント２６に対して第２管２４が同軸に保持されれば、結局第１管２２と第２管２４は同軸に保持される。この実施の形態では、ジョイント２６に第２管２４を回り止めして同軸に保持するが、第１管２２と第２管２４を直接的に回り止めして同軸に保持しても良い。

【００１７】回転規制クランプ３２について、図３に概略分解斜視図を、図４に平面図を、図５に正面図を示す。具体的な説明は図３を中心に行う。回転規制クランプ３２は金属製であり、外形がほぼ長方形の上板４２と、外形が凹形状（ほぼコ字型）の下板４４からなる。上板４２は、第１板バネに相当し、ジョイント２６の小径部２８の外周に半周以下の範囲で接する第1押圧面５２、ジョイント２６の大径部３０を収容する膨らみ６０、第２管２４の外周に半周以下の範囲で接する第２押圧面５４を備えている。凹形状の下板４４は、１枚の板で第２板バネ４８と第３板バネ５０を形成しており、全体として上板４２に開閉自在に組み付けられ、閉じられたときに第１押圧面５２が接する外周の半径方向反対側からその外周に接する第３押圧面５６と、上板４２との間で閉じられた状態を保持する保持手段６６を備えた第２板バネ４８および、閉じられたときに第２押圧面５４が接する外周の半径方向反対側からその外周に接する第４押圧面５８と、上板４２との間で閉じられた状態を保持する保持手段６７を備えた第３板バネ５０を形成している。第２板バネ４８と第３板バネ５０の間には切欠６２が設けられており、ここにジョイント２６の大径部が位置する。切欠６２によって第２板バネ４８と第３板バネ５０は実質的に独立して弾性変形する。

【００１８】上板４２には１辺に沿って２箇所に孔７２があけられ、下板４４には２個の孔７２に対応する位置にヒンジを形成する突起７０が形成されている。２個の突起７０が２個の孔７２に挿入された後に孔７２の形が塑性変形され、突起７０は孔７２から抜け止めされる。この結果、上板４２は下板４４に対して軸線７４のまわりに揺動する。その軸線７４の反対側の上板４２の一辺に、一対の係止用突起６４、６５が形成されている。下板４４の対応する位置に、一対の係止用孔６６、６７が形成されており、各係止用孔６６、６７の上部に斜め上方に伸びる案内縁６８、６９が形成されている。この構造を備えていることで、軸線７４の回りに上板４２を下板４４の側に揺動させると、最初は係止用突起６４、６５が案内縁６８、６９に当接して案内され、ついで上板４２と下板４４が相互に弾性変形して一対の係止用突起６４、６５が一対の孔６６、６７に入り込み、この段階で上板４２と下板４４がスプリングバックし一対の係止用突起６４、６５が一対の孔６６、６７に抜け止めされる。

【００１９】開放された状態の上板４２と下板４４間に、ジョイント２６で接続された燃料配管２２，２４を位置させ、この状態で上板４２と下板４４を閉じ、一対の係止用突起６４、６５を一対の孔６６、６７に抜け止めした状態が図２に示されており、第１板バネ４２と第２板バネ４８がジョイント２６の小径部２８の外周を押圧し、第１板バネ４２と第３板バネ５０が第２管２４の外周を押圧する。各板バネ４２、４８、５０は管の約半周（正確にはそれよりもわずかに狭い範囲）において管の外周に接する。各板バネ４２、４８、５０は自然形状において、相手側の管の半径よりも大きな曲率半径を持ち、上板４２と下板４４を閉じて一対の係止用突起６４、６５を一対の孔６６、６７に抜け止めする間に、より強く曲げられ、燃料配管２２、２４の外周を締め付ける。この締め付け力は燃料配管２２、２４の強度に比して弱く、燃料配管２２、２４を破壊することはなく、また、一対の板４２，４４を閉めるために特殊の動力工具を用いることなく、無動力の手動工具で閉じることができる。

【００２０】この状態で、回転トルクを測定する試験を実施したところ、金属製の管の断面円形の外周を金属製のバネで締め付けるだけで、エンジンルーム内の燃料配管に要求される程度には十分に相対回転を規制できることを確認した。回転トルクを測定した試験の結果を図６および図７に示す。図６は、回転規制クランプ３２で第１管２２と第２管２４を押圧している場合に、第１管２２を固定して第２管２４を相対回転させるのに必要な回転トルクの測定結果である。図６の横軸は、第２管２４の外径を示し、単位は（ｍｍ）である。縦軸は、第２管２４を相対回転させるのに必要な回転トルクを示し、単位は（Ｎ・ｃｍ）である。また、図６の８４、８６、８８は、それぞれ１回目、２回目、３回目の測定結果を示し、８２はこれら３回の測定結果の平均値を示す。本発明者らが多くのテストを行なったところ、燃料配管が５Ｎ・ｃｍのトルクに対して回り止めされていれば、エンジンとボディ間の相対振動に抗して十分に回り止めされており、長期間使用しても燃料配管の継ぎ手部から燃料が漏れ出すといった事故の発生を防止できることを確認した。図６に示すように、第２管２４の外径が大きくなるほど、第２管２４を相対回転させるのに必要な回転トルクは大きくなっていく。すなわち、管の外径が大きいほど金属製の板バネによって回り止めしやすいことがわかった。実用上、燃料配管は、外径が７．５ｍｍ以上であり、それ以上に細い管は通常使われない。図６の測定結果から明らかに、回り止めしにくい最も細い燃料配管でも、金属製の板バネによって６．３７Ｎ・ｃｍのトルクまで回り止めすることができる。従って、本実施の形態に係る回転規制クランプ３２によって、エンジンルーム内の燃料配管に必要な程度に強固に回り止めすることができることが確認された。通常の第２管２４は外径が８．０ｍｍであり、この場合、平均で２２．５４Ｎ・ｃｍのトルクまで回り止めされる。よって、本実施の形態に係る回転規制クランプ３２を用いれば十二分に回り止めできることがわかる。この測定結果から明らかなように、回り止めするために必要なトルクを得るために、管を潰すような大きなバネ力を必要としないことが確認された。

【００２１】図７は、回転規制クランプ３２で第１管２２と第２管２４を押圧している場合に、第２管２４を固定して第１管２２を相対回転させるのに必要な回転トルクの測定結果である。図７の符号の説明は、図６の場合と同様であるので省略する。第１管２２の外径が大きくなるほど、第１管２２を相対回転させるのに必要な回転トルクが大きくなっていくのは図６に示す第２管２４の場合と同様である。通常の第１管２２は外径が１２．０ｍｍであり、この場合、３回の試験の平均で４９．３０Ｎ・ｃｍのトルクまで回り止めされる。よって、本実施の形態に係る回転規制クランプ３２を用いれば十二分に回り止めできることがわかる。

【００２２】図６および図７の測定結果から明らかに、２つの燃料配管を回り止めするために必要なトルクは、通常の外径を持つ燃料配管であれば、金属製の回り止め部材による押圧力によって十分に確保されることが確認された。

【００２３】また、上板４２は１枚板であり、その１枚板に、ジョイント２６を締め付ける第１押圧面５２と第２管２４を締め付ける第２押圧面５４が形成されているために、両押圧面５２，５４の相対的位置関係を一定に維持する事ができ、回り止めした状態で、ジョイント２６と第２管２４の同軸度を損ねることはない。即ち、回り止めのためにクランプしたときに、Ｏリング３４を不均一に変形させることがなく、液密を損ねることはない。

【００２４】下板４４は１枚の板バネで形成されているものの、中間に大きな切欠６２が形成されていために、第２板バネ４８と第３板バネ５０は独立に変形する事ができる。このために、例えば第１板バネ４２と第２板バネ４８間で外径1.0ｍｍのジョイント２６を挟み込み、第１板バネ４２と第３板バネ５０間で外径８ｍｍの第２管を挟み込むように予定したときに、たまたまジョイント２６の外径が１０．１ｍｍであったときでも、第２管２４に対する締め付け力が不足する事がなく、それぞれの管に独立して必要な締め付け力を発揮する。これに対して、下板４４にも上板４２と同様な大径部収容用の膨らみを設けて第２板バネ４８と第３板バネ５０が独立に変形できないようにすると、予定していた外径よりも若干太いジョイント２６が使われていると第２管２４に対する締め付け力が不足し、予定していた外径よりも若干太い第２管２４が使われているとジョイント２６に対する締め付け力が不足してしまう。本実施形態のクランプ

３２では、切欠６２を設けて第２板バネ４８と第３板バネ５０が独立に変形するようにしているので、かかる問題が生じない。なお、下板４４を凹形状にして第２板バネ４８と第３板バネ５０が独立にクランプできるようにしていても、下板４４自体は１枚の板であるため、第２板バネ４８と第３板バネ５０は一体的に成形することができる。

【００２５】この回転規制クランプ３２は、ジョイント２６に第２管２４が抜け止めされるまで挿入されたことを確認する機能をも有している。もしもジョイント２６に第２管２４が抜け止めされるまで挿入されていない場合には、第１板バネ４２の第２押圧面５４または第３板バネ５０の第４押圧面５８が第２管２４の第２のリング状の膨出部４０の上に乗り上げることになる。この結果、上板４２の一対の係止用突起６４、６５が一対の係止用孔６６、６７に入り込むことができず、クランプすることができない。このため、回転規制クランプ３２が閉じられることによって、ジョイント２６に第２管２４が抜け止めされるまで挿入されたことを認識することができる。従来は、ジョイント２６に第２管２４が抜け止めされるまで挿入されたことを確認するために、第２のリング状の膨出部４０の位置にくぼみが形成されたプラスチック板をかぶせる必要があった。しかし、本発明に係る回転規制クランプ３２を用いれば、プラスチック板をかぶせることなく、ジョイント２６に第２管２４が抜け止めされるまで挿入されていることを確認することができる。

【００２６】以上に説明した実施の形態では、ジョイント２６の小径部２８と第２管２４の間で相対回転を規制するクランプ３２を用いたが、第１管２２と第２管２４の間で相対回転を規制するためにクランプ３２を用いても良い。この場合、クランプ３２の中間部分にジョイント２６の小径部２８と大径部３０の双方を受け入れるだけの膨らみと切込みを設ければよい。

【００２７】以上のように、この燃料配管２２、２４は、管の外周を第１板バネ４２、第２板バネ４８、第３板バネ５０で固定するという単純な構造で回り止めされているにすぎないにもかかわらず、必要な限度において長期間に亘って回り止めでき、燃料配管２２、２４に対し高い信頼性を実現する。本実施例によれば、燃料配管２２、２４がストレートに伸びていても、あるいは、燃料配管２２、２４に二面幅が確保されていなくとも、回り止めする事ができ、効果的に相対回転を規制することができる。

【００２８】以上、本発明の実施の形態について説明したが、本発明は上記の実施の形態になんら限定されるものではなく、当業者の知識に基づいて種々の変更、改良を施した形態で実施することができる。

【図面の簡単な説明】

【図１】従来技術に係る回転規制クランプの概略分解斜視図。

【図２】本発明に係る燃料配管の管接続部分の断面図。

【図３】本発明に係る回転規制クランプの概略分解斜視図。

【図４】本発明に係る回転規制クランプの平面図。

【図５】本発明に係る回転規制クランプの正面図。

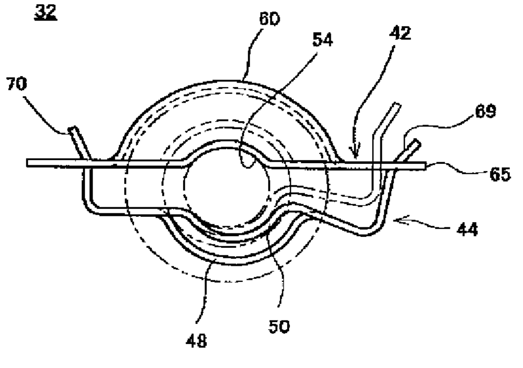
【図６】第２管を相対回転させるのに必要な回転トルクの測定結果。

【図７】第１管を相対回転させるのに必要な回転トルクの測定結果。

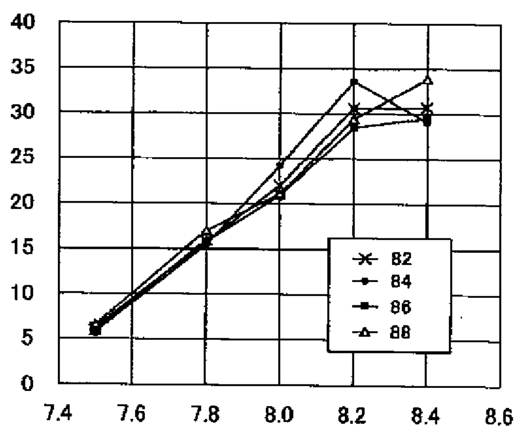
【符号の説明】

２２…第１管
２４…第２管
２６…ジョイント
３２…回転規制クランプ
４２…上板（第１板バネ）
４４…下板
４８…第２板バネ
５０…第３板バネ

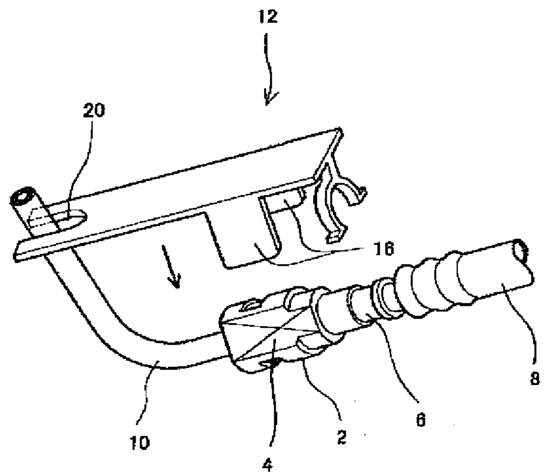
【図５】



【図６】



【図１】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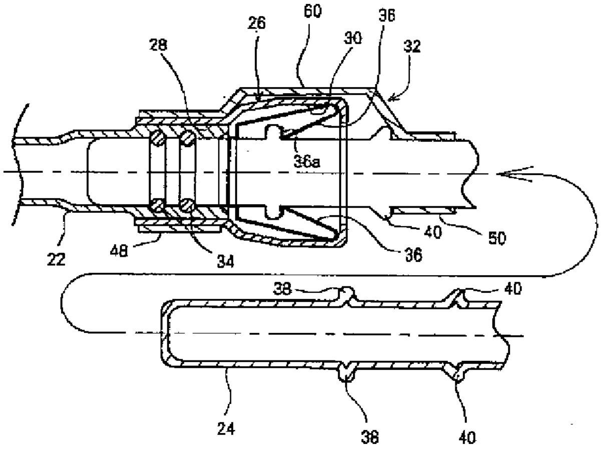
【図２】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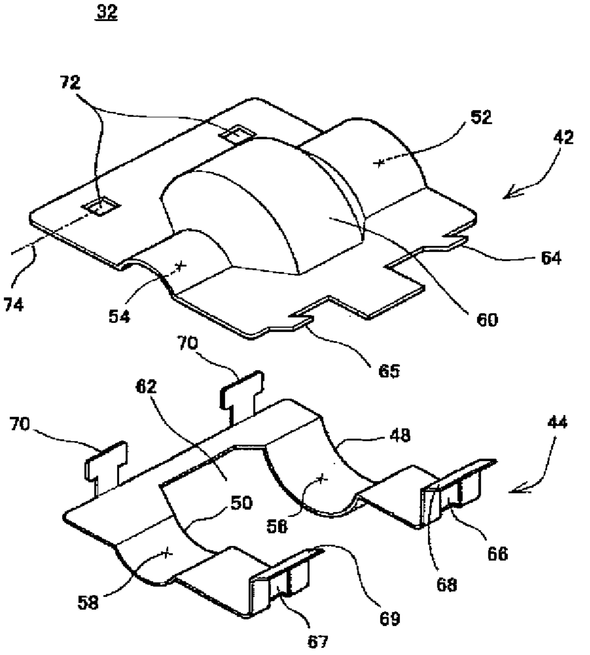
【図３】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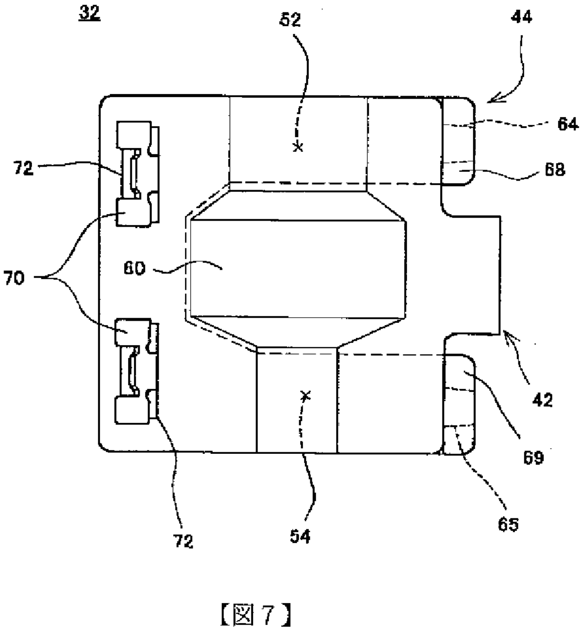
【図４】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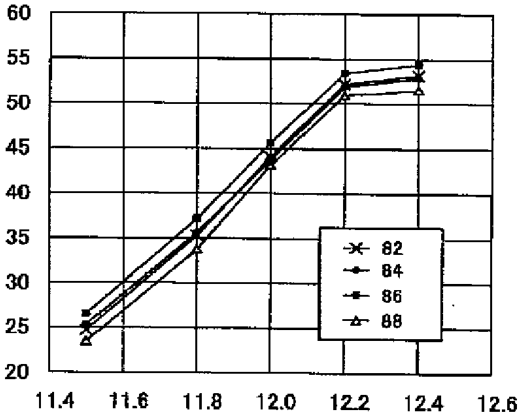
【図７】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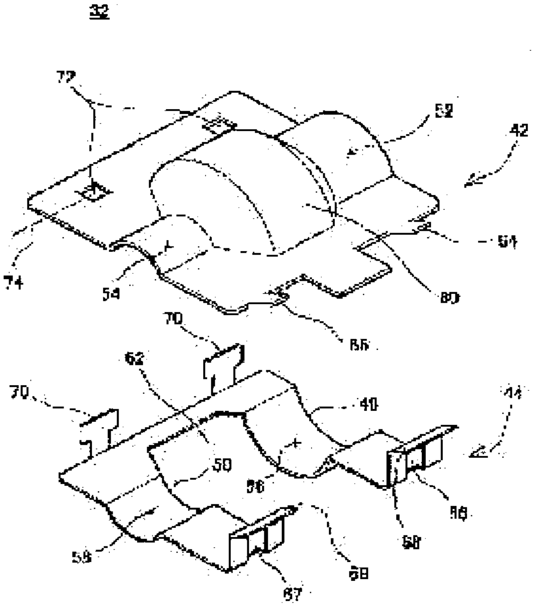
(54) ROTATION REGULATING CLAMP AND FUEL PIPE USING IT

(57)Abstract:



PROBLEM TO BE SOLVED: To regulate the relative rotation of two pipes generated caused by vibration generated in an engine room, even in a case where both pipes extend straight or two surface widths parallel to the outer periphery of the pipe are not secured.
SOLUTION: A rotation regulating clamp 32 is composed of an approximately rectangular upper plate 42 and a recessed lower plate 44. The upper plate 42 is a first plate spring having a first pressing surface 52 abutting on the outer periphery of the small-diameter part of a joint, a bulge 60 for hosing the largediameter part of the joint, and a second pressing surface 54 abutting on the outer periphery of a second pipe. The lower plate 44 is composed of a second plate spring 48 to be closably assembled to the upper plate 42 and having a third pressing surface 56 to be brought into contact with the outer periphery from the radial opposite side of the outer periphery to be brought into contact with the first pressing surface 52, and a holding means 66 for holding the closed state with the upper plate 42; and a third plate spring 50 having a fourth pressing surface 58 to be brought into contact with the outer periphery from the radial opposite side of the outer periphery to be brought into contact with the second pressing surface 54, and a holding means 67 for holding the closed state with the upper plate 42.

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CLAIMS

[Claim(s)]
[Claim 1] The joint of the 1st pipe to which the end side was connected in the condition that the other end side had relative rotation regulated to the minor diameter side of the tubular joint of a major diameter in a minor diameter, or the shape of its tubing, The 1st press side which is the clamp used in order to regulate relative rotation with the 2nd pipe inserted in the major-diameter side of the tubular joint, and touches the narrow diameter portion of joint, or the periphery of the 1st pipe in the range below a semicircle, The 1st flat spring which equipped the swelling which holds the major diameter of joint, and the periphery of the 2nd pipe with the 2nd press side which touches in the range below a semicircle, The 3rd press side which touches the periphery from the radial opposite side of a periphery where said 1st press side touches when it is attached to the 1st flat spring free [closing motion] and is closed, The 2nd flat spring equipped with a maintenance means to hold the condition of having been closed between said 1st flat spring, The rotation regulation clamp which has the 4th press side which touches the periphery from the radial opposite side of a periphery where said 2nd press side touches when it is attached to the 1st flat spring free [closing motion] and is closed, and the 3rd flat spring equipped with a maintenance means to hold the condition of having been closed between said 1st flat spring.
[Claim 2] The tips of the fuel line which is located in the engine room of an automobile and by which the base was attached in the car-body side, and the fuel line attached in the engine side An end side connects in a minor diameter and an other end side connects at the tubular joint of a major diameter. And while being continued and extended from the fuel line connected to the narrow diameter portion of joint, or its narrow diameter portion to the fuel line of another side The fuel line by which relative rotation of a car-body side fuel line and an engine side fuel line was regulated by the rotation regulation clamp made from a flat spring which has the piece of a spring of the pair which presses the periphery of the fuel line connected to the narrow diameter portion of joint, or its narrow diameter portion, and the piece of a spring of the pair which presses the periphery of the fuel line of another side.
[Claim 3] The fuel line which is located in the engine room of an automobile and by which the base was fixed to the car-body side, It is the approach of connecting the tips of the fuel line which is located in the engine room of an automobile and by which the base was fixed to the engine side, where relative rotation is regulated. Said tips are connected to tubing-like joint from an opposite direction, and both piping is connected. Subsequently The connection method of the fuel line which regulates relative rotation of both piping by pressing each periphery of tubing which regulates relative rotation, tubing which regulates relative rotation by the rotation regulation clamp extended ranging over tubing, and tubing.

[Translation done.]

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DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention] This invention relates to the technique which regulates relative rotation of two tubing connected at joint. In order to connect regulating relative rotation of the fuel line especially extended from a car-body side in the engine room of an automobile, and the fuel line extended from an engine side, it is related with a suitable technique.
[0002]
[Description of the Prior Art] the condition of having escaped from and carried out the stop of both the tubing when connecting two tubing -- liquid -- in order to connect densely, the technique of using joint is known. An example of the joint is indicated by JP,7-317982,A. Usually, one tubing is connected to the end side of joint by technique, such as press fit and a caulking, tubing of another side is inserted and both tubing is connected to the other end side of the joint of the condition. The structure from which it is made for inserted tubing of another side not to escape is prepared for the joint, therefore the insertion side serves as a major diameter. usually, seal members, such as an O ring, give between the periphery of inserted tubing, and the inner circumference of joint which accepts it -- having -- **** -- it -- both tubing -- liquid -- it connects densely. This connection technique is reliable and current multiple use is carried out.
[0003] However, it is necessary to forbid relative rotation of both tubing, for example by only connection by joint being insufficient and using a rotation prohibition clamp further, in order to continue under the environments where vibration and high temperature are added, such as piping of an automobile, at a long period of time and to maintain ****. It is because there is a possibility that the period which it is easy to damage seal members, such as an O ring, and can maintain a fluid-tight condition may be shortened when both tubing carries out relative rotation.
[0004] Then, in order to forbid relative rotation of both tubing, the technique of using a rotation prohibition clamp is developed variously. The example is indicated by JP,9-269088,A. This technique is explained using drawing 1 . With this technique, it connects so that the tip of one tubing 8 may be pressed fit in the narrow diameter portion 6 of joint 2 and may not carry out relative rotation. The tubing 10 of another side is inserted in the other end side of this joint 2. an O ring inserts between the periphery of tubing 10, and the inner circumference of joint 2 -- having -- tubing 8 and tubing 10 -- liquid -- it connects densely. The tubing 10 of joint 2 insertion-side serves as a major diameter, tubing 10 falls out to the interior, and stop structure is held in it. The width across flat 4 extended to notching **** parallel in a part of periphery of joint 10 is formed. The baffle of the rotation prohibition clamp 12 is carried out to joint 2 using the side attachment wall 16 of this width across flat 4 and a pair. Tubing 10 is bent in the point. The slit 20 which the bent tubing 10 passes is formed at the tip of the rotation prohibition clamp 12. Tubing 10 is forbidden from carrying out relative rotation to joint 2 by this slit 20.
[0005]
[Problem(s) to be Solved by the Invention] This technique is effective when tubing 10 has bent, but it is not effective when tubing 10 is extended straight. When tubing 10 is extended straight, it is necessary to prepare the parallel width across flat same with having prepared in joint 2 in the periphery of tubing 10. However, it is troublesome to form a width across flat parallel to the periphery of tubing 10, although not impossible, and it increases manufacture cost. Moreover,

many joint 2 by which current multiple use is carried out does not have an parallel width across flat, and this technique cannot be used to many joint.

[0006] Now, the technique which carries out a baffle by attaching a baffle member from an outside to the joint or tubing with a circular cross section of a periphery is not put in practical use, as far as the fuel line in an engine room is concerned at least. In order to use the reason in the engine room exposed to an elevated temperature It is not desirable that a joint and baffle member is also formed by resin etc. When based on the structure which needs to form with a metal, and attaches and carries out the baffle of the metal baffle member to the surroundings of metal tubing of a cross-section round shape, It is because it was thought that a press load to the extent that a special power tool is needed was needed in order to need a forcing load mighty in order to carry out a baffle effectively, and to destroy tubing depending on the case or to acquire the press load from coefficient of friction of metals being low.

[0007] However, this invention persons have recognized that the conventional idea is not just, as a result of [which is fundamental slag about the need of carrying out a baffle] carrying out. The reason recognized that the conventional idea is not just is as follows.

[0008] The fuel line in an engine room consists of connecting at joint the fuel line extended from a car-body side, and the fuel line extended from an engine side. The engine is connected through the engine mount to the car body, and since it has elasticity, the engine mount displaces an engine and a car body relatively. This variation rate is usually vibrating and it appears. Because the baffle of the two fuel lines is carried out in joint, even if an upper limit is in the torque which can regulate relative rotation by the rotation regulation clamp that what is necessary is to resist the above-mentioned vibration and just to be able to carry out a baffle, if it sees about a fuel line, it can be said that the baffle is fully carried out. It is because it has recognized that it is possible to carry out a baffle in the limit needed for the fuel line in an engine room without the periphery of metal tubing taking thrust to the extent that tubing is crushed with the method which presses a metal member, if it notes that what is necessary is just to be able to regulate relative rotation within the limits of it.

[0009] This invention makes it a technical problem to regulate relative rotation of two tubing which happens by vibration produced in an engine room, also when both tubing is straight extended based on the above recognition, and also when the width across flat parallel to the periphery of joint thru/or tubing is not secured.

[0010]

The means for solving a technical problem, and [an operation and effectiveness] The fuel line of this invention is a fuel line located in the engine room of an automobile, and connects the tips of the fuel line by which the base was attached in the car-body side, and the fuel line by which the base was attached in the engine side at tubular joint. The other end side of a major diameter is [an end side] tubular in a minor diameter, one fuel line is connected to the end side, and, as for the aforementioned joint, the fuel line of another side is connected to an other end side. By the fuel line of this invention, relative rotation is regulated to this connection structure by the rotation regulation clamp which has the die length continued and extended from the fuel line connected to the narrow diameter portion of joint, or its narrow diameter portion to the fuel line of another side. This rotation regulation clamp has the piece of a spring of the pair which presses the periphery of the fuel line connected to the narrow diameter portion of joint, or its narrow diameter portion, and the piece of a spring of the pair which pinches the periphery of the fuel line of another side, and is a product made from a flat spring. In spite of carrying out the baffle of this fuel line with the simple structure which presses the periphery of tubing by the flat spring, it can continue and carry out a baffle in a required limit at a long period of time, and realizes high dependability to a fuel line. Therefore, even if the width across flat is not secured to a fuel line even if the fuel line is extended straight or, a baffle can be carried out and relative rotation can be regulated. When equipped with seal members, such as an O ring, between fuel lines, relative rotation of both tubing may be directly regulated by the rotation regulation clamp, or when the relative rotation of one fuel line cannot be carried out at joint, relative rotation of the fuel line of another side and joint may be forbidden, and relative rotation of fuel lines may be regulated indirectly. the case where it is equipped with a seal member between one [joint and] fuel lines -- the fuel line of another side -- joint -- relative rotation -- impossible -- liquid -- it connects densely. In this case, the baffle of any of the fuel line of another side may be carried out to joint to one fuel line.

[0011] Moreover, the fuel line by which the connection method of the fuel line of this invention was located in the engine room of an automobile, and the base was fixed to the car-body side, It is a thing about the approach of connecting the tips of the fuel line which is located in the engine room of an automobile and by which the base was fixed to the engine side, where relative rotation is regulated. Said tips are connected to tubing-like joint from an opposite direction, and both piping is connected. Subsequently It is characterized by regulating relative rotation of both piping by pressing each periphery of tubing which regulates relative rotation, tubing which regulates relative rotation by the rotation regulation clamp extended ranging over tubing, and tubing. According to this connection method, a reliable fuel line can be attached by very easy actuation. Tubing and tubing which regulate relative rotation may be two fuel lines, if there is also a case of tubing-like joint and one fuel line.

[0012] This invention is embodied by the rotation regulation clamp itself again. This rotation regulation clamp is used in order that an end side may regulate relative rotation with the 2nd pipe inserted in the major-diameter side of the joint and tubular joint of its shape of the 1st pipe by which the other end side was connected to the minor diameter side of the tubular joint of a major diameter where relative rotation is regulated, or tubing in a minor diameter, and it is equipped with the 1st flat spring, the 2nd flat spring, and the 3rd flat spring. The 1st flat spring equips the 1st press side which touches the periphery of the 1st pipe in the range below a semicircle, the swelling which holds the major diameter of joint, and the periphery of the 2nd pipe with the 2nd press side which touches in the range below a semicircle. The 2nd flat spring is equipped with a maintenance means to hold the condition of having been closed between the 3rd press side which touches the periphery from the radial opposite side of a periphery where said 1st press side touches when it is attached to the 1st flat spring free [closing motion] and is closed, and said 1st flat spring. The 3rd flat spring is equipped with a maintenance means to hold the condition of having been closed between the 4th press side which touches the periphery from the radial opposite side of a periphery where said 2nd press side touches when it is attached to the 1st flat spring free [closing motion] and is closed, and said 1st flat spring. According to this clamp, two tubing is positioned by the same axle by the 1st flat spring, in that condition, the baffle of one tubing is carried out between the 1st flat spring and the 2nd flat spring, the baffle of the tubing of another side is carried out between the 1st flat spring and the 3rd flat spring, and the baffle of the two pipes is carried out after all.

[0013]

[Embodiment of the Invention] Next, the gestalt of operation of the fuel line using the rotation regulation clamp concerning this invention and it is explained based on an example. Drawing 2 is the sectional view of the connection part of a fuel line.

[0014] As shown in drawing 2 , in this connection part, 24 [pipe / 1st / pipe / 2nd] is connected with 22 by joint 26. And after [this] 24 [pipe / 1st / pipe / 2nd] is connected with 22 at joint 26, the clamp 32 which regulates relative rotation is attached from the outside. The 2nd pipe after 24 [pipe / 2nd] was shown by the cross section and inserted, before being inserted in joint 26 is shown by the visible outline.

[0015] 22 is the fuel line fabricated with heat resistant resin, and the 1st pipe of the base which is not illustrated is being fixed to the car-body side. it is inserted from this narrow diameter portion 28 of the joint 26 of metal [tip / of 22] the 1st pipe, and the narrow diameter portion 28 of joint 26 closes from an outside in that condition -- having -- the 1st -- pipe 22 -- the narrow diameter portion 28 of joint 26 -- liquid -- it connects with dense and relative rotation impossible. It escapes inside the major diameter 30 of joint 26, and the stop spring 36 is inserted in it. The free-end 36a side of this omission stop spring 36 is divided into the circumferencial direction, and has opening in the core of free-end 36a. 24 is a metal fuel line and the 2nd pipe of the base which is not illustrated is being fixed to the engine. The 2nd pipe of the bulge section 38 of the shape of 1st ring and the bulge section 40 of the shape of 2nd ring are formed near the tip of 24.

[0016] The bulge section 38 of the shape of 1st ring falls out, if 24 [pipe / 2nd] is inserted in the major diameter 30 of joint 26, main opening of the stop spring 36 will be extended and it will pass, and when it passes, it escapes and is made for 24 not to escape [free-end 36a of stop spring 36] from the 2nd pipe of joint 26 in contact with the bulge section 38 of the shape of 1st ring from illustration right-hand side. if it is inserted until the 1st pipe of two O rings 34 is set inside 22, 24 escapes from the 2nd pipe and a stop is extracted and carried out with the stop spring 36 -- the O ring 34 -- the 2nd -- the periphery of pipe 24 -- sticking -- the 1st -- pipe 22 and the 2nd -- pipe 24 -- liquid -- it connects densely. If 24 continues the 1st pipe of the 2nd pipe of relative rotation with 22, O ring 34 is damaged and it may be broken by fluid-tight ********. Or if the 1st pipe of the 2nd pipe of the coaxiality of 24 is lost with 22, O ring 34 deforms into an ununiformity and this can also cause fluid-tight **********. Since the baffle of 22 [pipe / 1st] is carried out to joint 26 at the above-mentioned appearance, if the baffle of 24 [pipe / 2nd] is carried out to joint 26, the baffle of 24 [pipe / 1st / pipe / 2nd] will be carried out to 22 after all. Moreover, if 24 [pipe / 2nd] is held to joint 26 at the same axle, 24 [pipe / 1st / pipe / 2nd] will be held with 22 after all at the same axle. Although the baffle of 24 [pipe / 2nd] is carried out to joint 26 and held on the same axle with the gestalt of this operation, the baffle of 24 [pipe / 1st / pipe / 2nd] may be directly carried out to 22, and you may hold on the same axle.

[0017] the rotation regulation clamp 32 -- a top view is shown in drawing 4 and a front view is shown for an outline decomposition perspective view in drawing 3 at drawing 5 . Concrete explanation is given focusing on drawing 3 . The rotation regulation clamp 32 is metal and an appearance serves as [an appearance] the rectangular superior lamella 42 from the inferior lamella 44 of a concave configuration (almost horseshoe-shaped) mostly. The superior lamella 42 was equivalent to the 1st flat spring, and is equipped with the 1st press side 52 which touches the periphery of the narrow diameter portion 28 of joint 26 in the range below a semicircle, the swelling 60 which holds the major diameter 30 of joint 26, and the 2nd press side 54 which touches the periphery of 24 in the range below a semicircle the 2nd pipe. The inferior lamella 44 of a concave configuration forms the 2nd flat spring 48 and the 3rd flat spring 50 with one plate. The 3rd press side 56 which touches the periphery from the radial opposite side of a periphery where the 1st press side 52 touches when it is attached to a superior lamella 42 free [closing motion] and is closed as a whole, The 2nd flat spring 48 equipped with a maintenance means 66 to hold the condition of having been closed between superior lamellas 42, and the 4th press side 58 which touches the periphery from the radial opposite side of a periphery where the 2nd press side 54 touches when closed, The 3rd flat spring 50 equipped with a maintenance means 67 to hold the condition of having been closed between superior lamellas 42 is formed. Notching 62 is formed between the 2nd flat spring 48 and the 3rd flat spring 50, and the major diameter of joint 26 is located here. Elastic deformation of the 2nd flat spring 48 and the 3rd flat spring 50 is substantially carried out independently by notching 62.

[0018] A hole 72 is opened in a superior lamella 42 by two places along with one side, and the projection 70 which forms a hinge in the location corresponding to two holes 72 is formed in the inferior lamella 44. After two projections 70 are inserted in two holes 72, plastic deformation of the form of a hole 72 is carried out, projection 70 escapes from a hole 72 and a stop is carried out. Consequently, a superior lamella 42 is rocked around an axis 74 to an inferior lamella 44. The projections 64 and 65 for a stop of a pair are formed in one side of the superior lamella 42 of the opposite side of the axis 74. The holes 66 and 67 for a stop of a pair are formed in the location where an inferior lamella 44 corresponds, and the guidance edges 68 and 69 extended to the slanting upper part are formed in the upper part of each holes 66 and 67 for a stop. By having this structure, if a superior lamella 42 is made to rock around an axis 74 at an inferior lamella 44 side The projections 64 and 65 for a stop are guided in contact with the guidance edges 68 and 69 at first. Subsequently, a superior lamella 42 and an inferior lamella 44 carry out elastic deformation mutually, the projections 64 and 65 for a stop of a pair enter into the holes 66 and 67 of a pair, a superior lamella 42 and an inferior lamella 44 carry out springback in this phase, and the stop of the projections 64 and 65 for a stop of a pair is escaped from and carried out to the holes 66 and 67 of a pair.

[0019] Between the superior lamella 42 in the condition of having been opened wide, and an inferior lamella 44, the fuel lines 22 and 24 connected at joint 26 are located. Close a superior lamella 42 and an inferior lamella 44 in this condition, and the condition of having escaped from and carried out the stop of the projections 64 and 65 for a stop of a pair to the holes 66 and 67 of a pair is shown in drawing 2 . The 1st flat spring 42 and the 2nd flat spring 48 press the periphery of the narrow diameter portion 28 of joint 26, and the 1st flat spring 42 and the 3rd flat spring 50 press the 2nd pipe of the periphery of 24. Each flat springs 42, 48, and 50 touch the periphery of tubing in the abbreviation semicircle (it is the range slightly narrower than it correctly) of tubing. In a natural configuration, each flat springs 42, 48, and 50 have bigger radius of curvature than the radius of tubing of the other party, close a superior lamella 42 and an inferior lamella 44, while escaping from and carrying out the stop of the projections 64 and 65 for a stop of a pair to the holes 66 and 67 of a pair, are bent more strongly and bind the periphery of fuel lines 22 and 24 tight. This bolting force can be closed by the manual tool of non-power, without using a special power tool, in order are weak, and not to destroy fuel lines 22 and 24 as compared with the reinforcement of fuel lines 22 and 24 and to shut the plates 42 and 44 of a pair.

[0020] When the trial which measures running torque was carried out in this condition, it checked that relative rotation was fully controllable to extent required of the fuel line in an engine room only by binding the periphery of the cross-section round shape of metal tubing tight with a metal spring. The result of the trial which measured running torque is shown in drawing 6 and drawing 7 . Drawing 6 is as a result of [of running torque required to fix 22 / pipe / 1st / and carry out relative rotation of 24 / pipe / 2nd] measurement, when 24 [pipe / 1st / pipe / 2nd] is being pressed with 22 by the rotation regulation clamp 32. The axis of abscissa of drawing 6 shows the 2nd pipe of the outer diameter of 24, and a unit is (mm). An axis of ordinate shows running torque required to carry out relative rotation of 24 [pipe / 2nd], and a unit is (N-cm). Moreover, 84, 86, and 88 of drawing 6 show the 1st time, the 2nd time, and the 3rd measurement result, respectively, and 82 shows the average of these 3 times of measurement results. When this invention persons tested many and the baffle of the fuel line was carried out to the torque of 5 N-cm, even if it resists the relative vibration between an engine and the body, the baffle is fully carried out and it used it for a long period of time, it checked that the occurrence of the accident in which a fuel begins to leak from the splice section of a fuel line could be prevented. Running torque required to carry out relative rotation of 24 [pipe / 2nd] becomes large, so that the 2nd pipe of the outer diameter of 24 becomes large, as shown in drawing 6 . That is, it turned out that it is easy to carry out a baffle by the metal flat spring, so that the outer diameter of tubing was large. Practically, the outer diameter of a fuel line is 7.5mm or more, and thinner tubing than it is not usually used. The baffle also of the thinnest fuel line that cannot carry out a baffle easily can be carried out to the torque of 6.37 N-cm by the metal flat spring clearly from the measurement result of drawing 6 . Therefore, it was checked by the rotation regulation clamp 32 concerning the gestalt of this operation that a baffle can be firmly carried out to extent required for the fuel line in an engine room. An outer diameter is 8.0mm and the baffle of the 2nd usual tubing 24 is carried out to the torque of 22.54N and cm on an average in this case. Therefore, if the rotation regulation clamp 32 concerning the gestalt of this operation is used, it turns out that a baffle can be carried out more than enough. In order to acquire torque required in order to carry out a baffle so that clearly from this measurement result, not needing big spring force which crushes tubing was checked.

[0021] Drawing 7 is as a result of [of running torque required to fix 24 / pipe / 2nd / and carry out relative rotation of 22 / pipe / 1st] measurement, when 24 [pipe / 1st / pipe / 2nd] is being pressed with 22 by the rotation regulation clamp 32. Since it is the same as that of the case of drawing 6 , explanation of the sign of drawing 7 is omitted. it is shown in drawing 6 that running torque required to carry out relative rotation of 22 [pipe / 1st] becomes large, so that the 1st pipe of the outer diameter of 22 becomes large -- the 2nd pipe is the same as that of the case of 24. The baffle of 22 is carried out to the torque of 49.30 N-cm by the usual average of the trial whose outer diameter is 12.0mm and whose 1st pipe is 3 times in this case. Therefore, if the rotation regulation clamp 32 concerning the gestalt of this operation is used, it

turns out that a baffle can be carried out more than enough.
[0022] When torque required clearly from drawing 6 and the measurement result of drawing 7 in order to carry out the baffle of the two fuel lines was a fuel line with the usual outer diameter, fully being secured by the thrust by the metal baffle member was checked.
[0023] Moreover, a superior lamella 42 is a single plate, is in the condition which could maintain uniformly the relative location of both the press sides 52 and 54, and carried out the baffle since the 1st press side 52 which binds joint 26 tight to the single plate, and the 2nd press side 54 which binds 24 [pipe / 2nd] tight were formed, and does not spoil the 2nd pipe of the coaxiality of 24 with joint 26. That is, when it clamps for a baffle, O ring 34 is not made to transform into an ununiformity, and **** is not spoiled.
[0024] Although the inferior lamella 44 is formed by the flat spring of one sheet, the big notching 62 is formed in the middle and it can deform independently the 2nd flat spring 48 and the 3rd flat spring 50 into a sake. For this reason, even when it plans so that the joint 26 with an outer diameter of 10mm may be put, for example between the 1st flat spring 42 and the 2nd flat spring 48 and the 2nd pipe with an outer diameter of 8mm may be put between the 1st flat spring 42 and the 3rd flat spring 50 and the outer diameter of joint 26 is 10.1mm by chance, the 2nd pipe of the bolting force over 24 is not insufficient, and the required bolting force is demonstrated independently in each tubing. On the other hand, if the same swelling for major diameter hold as a superior lamella 42 is prepared also in an inferior lamella 44 and the 2nd flat spring 48 and the 3rd flat spring 50 prevent from deforming independently If the joint [a little] 26 thicker than the outer diameter which was being planned is used, the 2nd pipe of the bolting force over 24 will be insufficient, and the as opposed to [when 24 / pipe / 2nd / is used] joint 26 a little bolting force thicker than the outer diameter which was being planned will be insufficient. In the clamp 32 of this operation gestalt, since notching 62 is formed and he is trying for the 2nd flat spring 48 and the 3rd flat spring 50 to deform independently, this problem does not arise. In addition, even if it makes an inferior lamella 44 into a concave configuration and the 2nd flat spring 48 and the 3rd flat spring 50 enable it to clamp independently, since it is one plate, inferior lamella 44 the very thing can fabricate the 2nd flat spring 48 and the 3rd flat spring 50 in one.
[0025] It also has the function to check that this rotation regulation clamp 32 has been inserted until the stop of 24 [pipe / 2nd] was escaped from and carried out to joint 26. When not being inserted until the stop of 24 [pipe / 2nd] is escaped from and carried out to joint 26, the 2nd press side 54 of the 1st flat spring 42 or the 2nd pipe of the 4th press side 58 of the 3rd flat spring 50 will run aground on the bulge section 40 of the 2nd shape of a ring of 24. Consequently, the projections 64 and 65 for a stop of the pair of a superior lamella 42 cannot enter into the holes 66 and 67 for a stop of a pair, and cannot clamp. For this reason, it can recognize having been inserted until the stop of 24 [pipe / 2nd] was escaped from and carried out to joint 26 by closing the rotation regulation clamp 32. In order to check that it has been inserted until the stop of 24 [pipe / 2nd] was conventionally escaped from and carried out to joint 26, the plastic sheet with which the impression was formed in the location of the bulge section 40 of the shape of 2nd ring needed to be put. However, it can check being inserted until the stop of 24 [pipe / 2nd] is escaped from and carried out to joint 26, without putting a plastic sheet, if the rotation regulation clamp 32 concerning this invention is used.
[0026] Although the narrow diameter portion 28 of joint 26 and the clamp 32 which regulates the 2nd pipe of relative rotation between 24 were used with the gestalt of the operation explained above, a clamp 32 may be used in order to regulate the 1st pipe of the 2nd pipe of relative rotation between 24 with 22. In this case, what is necessary is just to prepare the swelling and infeed which receive the both sides of the narrow diameter portion 28 of joint 26, and a major diameter 30 in the interstitial segment of a clamp 32.
[0027] As mentioned above, in spite of carrying out the baffle of these fuel lines 22 and 24 with the simple structure of fixing the periphery of tubing by the 1st flat spring 42, the 2nd flat spring 48, and the 3rd flat spring 50, they can continue and carry out a baffle in a required limit at a long period of time, and realize high dependability to fuel lines 22 and 24. Even if according to this example the width across flat is not secured to fuel lines 22 and 24 even if fuel lines 22 and 24 are extended straight or, a baffle can be carried out and relative rotation can be regulated

effectively.
[0028] As mentioned above, although the gestalt of operation of this invention was explained, this invention is not limited to the gestalt of the above-mentioned operation at all, and can be carried out with the gestalt which performed various modification and amelioration based on this contractor's knowledge.

[Translation done.]

* NOTICES *

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2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]

[Drawing 1] The outline decomposition perspective view of the rotation regulation clamp concerning the conventional technique.

[Drawing 2] The sectional view for a tubing connection of the fuel line concerning this invention.

[Drawing 3] The outline decomposition perspective view of the rotation regulation clamp concerning this invention.

[Drawing 4] The top view of the rotation regulation clamp concerning this invention.

[Drawing 5] The front view of the rotation regulation clamp concerning this invention.

[Drawing 6] The measurement result of running torque required to carry out relative rotation of the 2nd pipe.

[Drawing 7] The measurement result of running torque required to carry out relative rotation of the 1st pipe.

[Description of Notations]
22 -- The 1st pipe
24 -- The 2nd pipe
26 -- Joint
32 -- Rotation regulation clamp
42 -- Superior lamella (the 1st flat spring)
44 -- Inferior lamella
48 -- The 2nd flat spring
50 -- The 3rd flat spring

[Translation done.]

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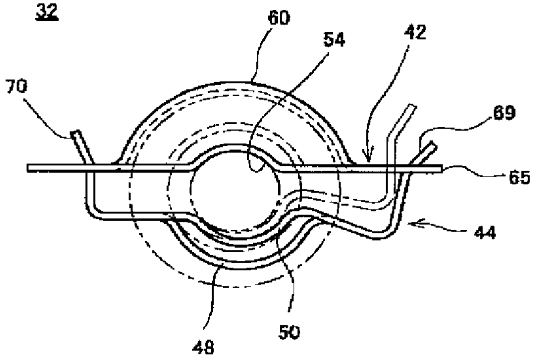
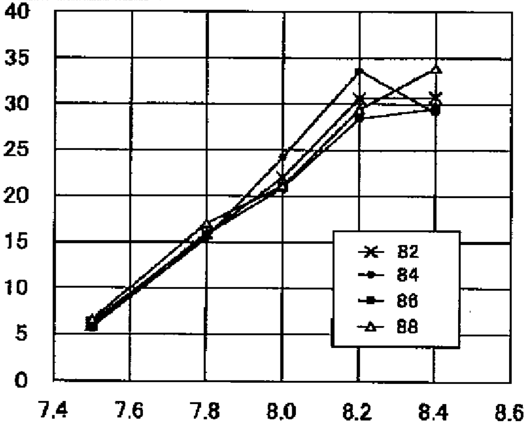
DRAWINGS

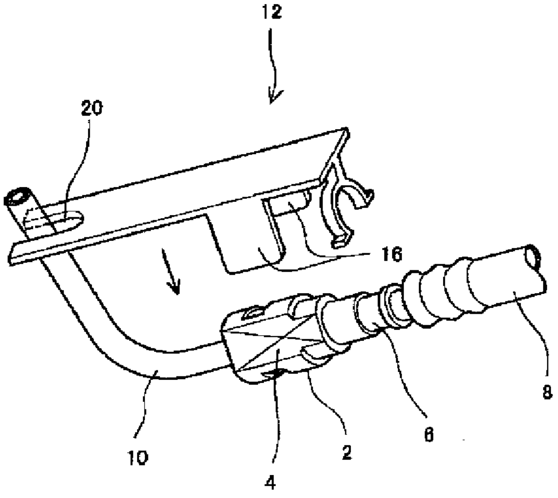
[Drawing 5]



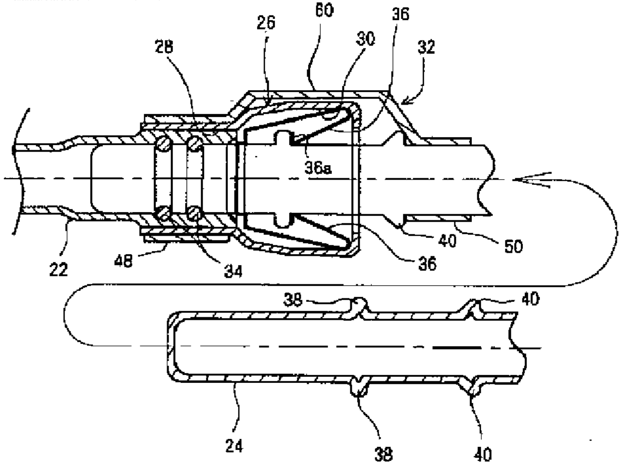
[Drawing 6]



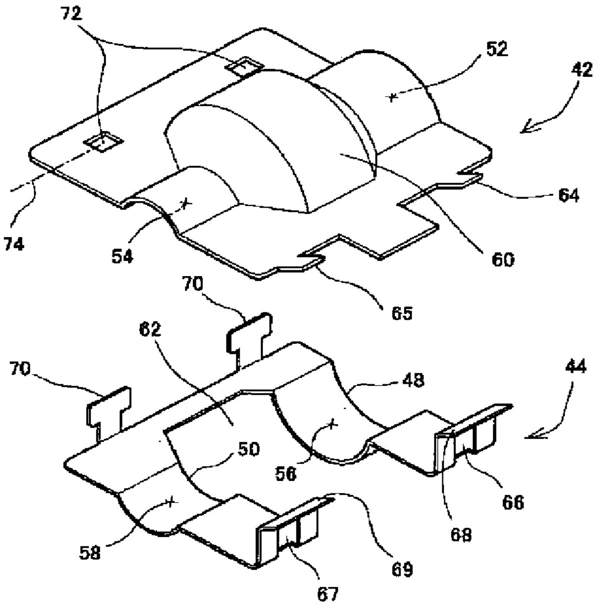
[Drawing 1]



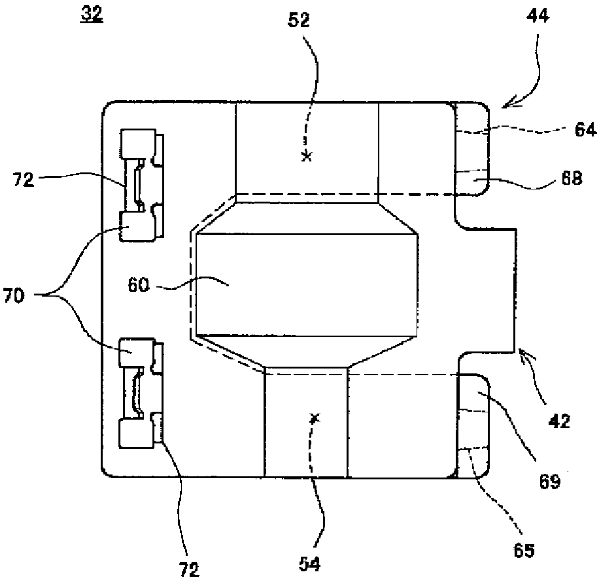
[Drawing 2]



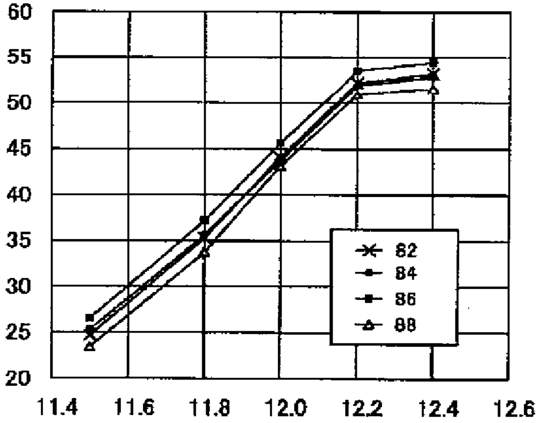
[Drawing 3]
32



[Drawing 4]



[Drawing 7]



[Translation done.]